

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Claim 1 (Currently Amended) A random access memory (RAM) incorporated display driver for displaying display data stored in the incorporated RAM on a display screen, comprising:

a RAM configured to store the display data to be displayed on the display screen;

a latch shift register configured to receive the display data read out from said RAM and if said display screen is intended to be scrolled in a horizontal direction, shift said read out display data depending on the scrolling direction and if said display screen is intended to be scrolled in a vertical direction, hold said read out display data; and

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an access control circuit configured to read out the display data from said RAM, send the read out display data to said latch shift register, and if said display screen is intended to be scrolled in a horizontal direction, write back the display data shifted by said latch shift register into an original region in said RAM and if said display screen is intended to be scrolled in a vertical direction, write back the display data held by said latch shift register into a region in said RAM moved by the amount of the scroll from the original region of said RAM, and supply the written back display data in said RAM to said display screen according to a screen control signal supplied by a CPU configured outside of the display driver.

Claim 2. (Original) The RAM incorporated display driver according to claim 1, wherein said access control circuit comprises:

a switching circuit configured to switch a direction for reading out the display data from said RAM serially to an opposite direction, if the display screen is intended to be scrolled vertically downward, to that of scrolling the display screen vertically upward.

Claim 3. (Original) The RAM incorporated display driver according to claim 1, further comprising:

a first selecting circuit configured to select a region in a horizontal direction capable of being scrolled in the display screen, wherein said access control circuit supplies display data in a region selected by said first selecting circuit to said latch shift register.

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Claim 4. (Original) The RAM incorporated display driver according to claim 1, further comprising:

a second selecting circuit configured to select a region in a vertical direction capable of being scrolled in the display screen, wherein said access control circuit supplies display data in a region selected by said second selecting circuit to said latch shift register.

Claim 5. (Original) The RAM incorporated display driver according to claim 3, wherein said first selecting circuit includes a shift register of the same bit number as that of one dot line of said RAM.

Claim 6. The RAM incorporated display driver according to claim 4, wherein said second selecting circuit includes a comparing circuit configured to compare a value of an address in a vertical direction to be scrolled with a content of an address counter indicating a selected address in the vertical direction in said RAM.

Claim 7. (Original) The RAM incorporated display driver according to claim 1, wherein said display is a liquid crystal display (LCD).

Claim 8 (Currently Amended) An image display apparatus for display data stored in [the] an incorporated RAM, comprising:

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- a display;
- a system driver for driving said display; and
- a CPU for supplying a signal for controlling the display screen to said system driver,

wherein said system driver includes:

- a RAM configured to store the display data to be displayed on the display screen;
- a latch shift register configured to receive the display data read out from said RAM and if said display screen is intended to be scrolled in a horizontal direction, shift said read out display data depending on the scrolling direction and if said display screen is intended to be scrolled in a vertical direction, hold said read out display data; and
- an access control circuit configured to read out the display data form said RAM, send the read out display data to said latch shift register, and if said display screen is intended to be scrolled in a horizontal direction, write back the display data shifted by said latch shift register into an original region in said RAM and if said display screen is intended to be scrolled in a vertical direction, write back the display data held by said latch shift register into a region in said RAM moved by the amount of the scroll from the original region of said RAM, and supply the written back display data in said RAM to said display screen according to a screen control signal supplied by a CPU configured outside of the display driver.

Claim 9. (Original) The image display apparatus according to claim 8, wherein said access control circuit comprises:

a switching circuit configured to switch a direction for reading out the display data from said RAM to an opposite direction, if the display screen is intended to be scrolled vertically downward, to that of scrolling the display screen vertically upward.

Claim 10. (Original) The image display apparatus according to claim 8, wherein said system driver further comprises:

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a first selecting circuit configured to select a region in a horizontal direction capable of being scrolled in the display screen, wherein said access control circuit supplies display data in a region selected by said first selecting circuit to said latch shift register.

Claim 11. (Original) The image display apparatus according to claim 8, wherein said system driver further comprises:

a second selecting circuit configured to select a region in a vertical direction capable of being scrolled in the display screen, wherein said access control circuit supplies display data in a region selected by said second selecting circuit to said latch shift register.

Claim 12. (Original) The image display apparatus according to claim 10, wherein said first selecting circuit includes a shift register of the same bit number as that of one dot line of said RAM.

Claim 13. (Original) The image display apparatus according to claim 11, wherein said second selecting circuit includes a comparing circuit configured to compare a value of an

address in a vertical direction to be scrolled with a content of an address counter indicating a selected address in the vertical direction in said RAM>

Claim 14. (Original) The image display apparatus according to claim 8, wherein said display is a liquid crystal display (LCD).

Claim 15 (Currently Amended) A memory incorporated display driver for displaying display data stored in the incorporated memory on a display screen, comprising:

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a memory configured to store the display data to be displayed on the display screen; a latch shift register configured to receive the display data read out from said memory and if said display screen is intended to be scrolled in a horizontal direction, shift said read out display data depending on the scrolling direction and if said display screen is intended to be scrolled in a vertical direction, hold said read out display data; and

an access control circuit configured to read out the display data from said memory, send the read out display data to said latch shift register, and if said display screen is intended to be scrolled in a horizontal direction, write back the display data shifted by said latch shift register into an original region in said memory and if said display screen is intended to be scrolled in a vertical direction, write back the display data held by said latch shift register into a region in said memory moved by the amount of the scroll from the original region of said memory[, whereby said written back display data is supplied to said display screen by said access control unit], and supply the written back display data in said memory to said display screen according to a screen control signal supplied by a CPU configured outside of the display driver.

Claim 16. (Original) The memory incorporated display driver according to claim 15, wherein said access control unit comprises:

a switching unit configured to switch a direction for reading out the display data from said memory serially to an opposite direction, if the display screen is intended to be scrolled longitudinally downward, to that of scrolling the display screen longitudinally upward.

Claim 17. (Original) The memory incorporated display driver according to claim 15, further comprising:

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a first selecting unit configured to select a region in a lateral direction capable of being scrolled in the display screen, wherein said access control unit supplies display data in a region selected by said first selecting unit to said latch shift unit.

Claim 18. (Original) The memory incorporated display driver according to claim 15, further comprising:

a second selecting unit configured to select a region in a longitudinally direction capable of being scrolled in the display screen, wherein said access control unit supplies display data in a region selected by said second selecting unit to said latch shift unit.

Claim 19. (Original) The memory incorporated display driver according to claim 17, wherein said first selecting unit includes a shift register of the same bit number as that of one dot line of said memory.

Claim 20. (Original) The memory incorporated display driver according to claim 18, wherein said second selecting unit includes a comparator configured to compare a value of an address in a longitudinal direction to be scrolled with a content of an address counter indicating a selected address in the longitudinal direction in said memory.

Claim 21 (New) A method of scrolling display data stored in an incorporated random access memory (RAM) in a display driver, comprising:

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reading out the display data from said RAM;
sending the read out display data to a latch shift register;
if said display screen is intended to be scrolled in a horizontal direction, shifting said read out display data depending on the scrolling direction, and if said display screen is intended to be scrolled in a vertical direction, holding said read out display data in said latch register;

if said display screen is intended to be scrolled in a horizontal direction, writing back the display data shifted in said latch shift register into an original region in said RAM, and if said display screen is intended to be scrolled in a vertical direction, writing back the display data held by said latch shift register into a region in said RAM moved by the amount of the scroll from the original region of said RAM; and

supplying the written back display data in said RAM to a display screen according to a screen control signal supplied by a CPU configured outside of the display driver.

Claim 22 (New) A random access memory (RAM) incorporated display driver for displaying display data stored in the incorporated RAM on a display screen, comprising:
a RAM configured to store the display data to be displayed on the display screen;

a latch shift register configured to receive the display data read out from said RAM and if said display screen is intended to be scrolled in a horizontal direction, shift said read out display data depending on the scrolling direction and if said display screen is intended to be scrolled in a vertical direction, hold said read out display data;

an access control circuit configured to read out the display data form said RAM and if said display screen is intended to be scrolled in a horizontal direction, write back the display data shifted by said latch shift register into an original region in said RAM and if said display screen is intended to be scrolled in a vertical direction, write back the display data held by said latch shift register into a region moved by the amount of the scroll from the original region of said RAM; and

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a first selecting circuit configured to select a region in a horizontal direction capable of being scrolled in the display screen, wherein said access control circuit supplies display data in a region selected by said first selecting circuit to said latch shift register.

Claim 23 (New) An image display apparatus for displaying display data stored in an incorporated RAM, comprising:

a display;
a system driver for driving said display; and
a CPU for supplying a signal for controlling the display screen to said system driver, wherein said system driver includes:

a RAM configured to store the display data to be displayed on the display screen;
a latch shift register configured to receive the display data read out from said RAM and if said display screen is intended to be scrolled in a horizontal direction, shift said read

out display data depending on the scrolling direction and if said display screen is intended to be scrolled in a vertical direction, hold said read out display data;

an access control circuit configured to read out the display data form said RAM and if said display screen is intended to be scrolled in a horizontal direction, write back the display data shifted by said latch shift register into an original region in said RAM and if said display screen is intended to be scrolled in a vertical direction, write back the display data held by said latch shift register into a region moved by the amount of the scroll from the original region of said RAM; and

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a first selecting circuit configured to select a region in a horizontal direction capable of being scrolled in the display screen, wherein said access control circuit supplies display data in a region selected by said first selecting circuit to said latch shift register.

24. (New) A memory incorporated display driver for displaying display data stored in the incorporated memory on a display screen, comprising:

a memory configured to store the display data to be displayed on the display screen; a latch shift register configured to receive the display data read out from said memory and if said display screen is intended to be scrolled in a horizontal direction, shift said read out display data depending on the scrolling direction and if said display screen is intended to be scrolled in a vertical direction, hold said read out display data;

an access control circuit configured to read out the display data form said memory and if said display screen is intended to be scrolled in a horizontal direction, write back the display data shifted by said latch shift register into an original region in said memory and if said display screen is intended to be scrolled in a vertical direction, write back the display

data held by said latch shift register into a region moved by the amount of the scroll from the original region of said memory; and

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a first selecting circuit configured to select a region in a horizontal direction capable of being scrolled in the display screen, wherein said access control circuit supplies display data in a region selected by said first selecting circuit to said latch shift register.